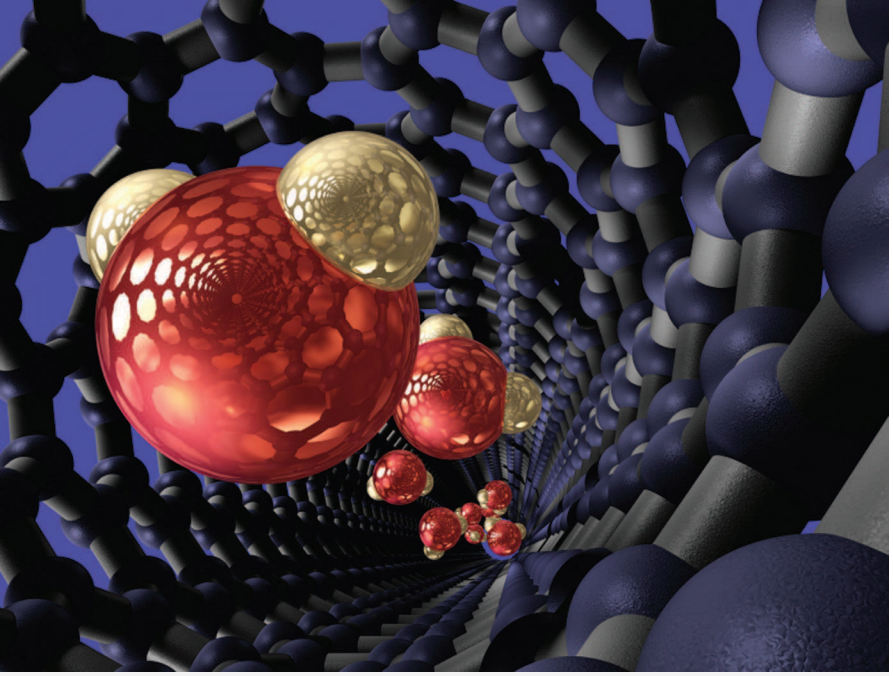

National Aeronautics and
Space Administration

technology solution

Health, Medicine and Biotechnology

Filtering Molecules with Nanotube Technology

Effectively eliminates contaminants from water or other molecules

Innovators at NASA's Johnson Space Center have developed a filtration device to eliminate contaminants from water supplies. Originally developed to purify wastewater for reuse aboard the International Space Station, the innovation is applicable to numerous situations on Earth where there is a need to collect potable, medical-grade water from a contaminated water supply. The unique aspect of the technology is its use of acoustics rather than pressure to drive water through small-diameter carbon nanotubes. The invention requires less power than conventional filtration systems and is well-suited to a variety of water processing needs.

BENEFITS

- Effective: Produces clean water by eliminating contaminants
- Efficient: Requires less power than conventional filtration systems
- Flexible: Does not depend on gravity for water to flow through the system
- Scalable: Use a single filter or a large bank of integrated filters
- Widely applicable: Suits applications for a variety of water processing needs

THE TECHNOLOGY

This water filtration innovation is an acoustically driven molecular sieve embedded with small-diameter carbon nanotubes. First, water enters the device and contacts the filter matrix, which can be made of polymer, ceramic, or metallic compounds. Carbon nanotubes within the matrix allow only water molecules to pass through, leaving behind any larger molecules and contaminants. The unique aspect of the technology is its use of acoustics to help drive water through the filter.

An oscillator circuit attached to the filter matrix propagates acoustic vibration, further causing water molecules to de-bond and move through the filter. This use of acoustics also eliminates dependence on gravity (and thus filter orientation) to move water through the device. When water exiting the system diminishes to a pre-determined set point, a cleaning cycle is triggered to clear the sediment from the inlet of the filter, reestablishing the standard system flow rate. Unlike other filtration systems, flushing of the filter system is not required. The combination of acoustics and small-diameter carbon nanotubes in this innovation make it an effective and efficient means of producing contaminant-free, clean water.

Existing water filtration technologies are generally plagued by limited performance, high energy consumption, and high costs.

Ultrapure water can be produced through this acoustically driven water filtration system.

APPLICATIONS

The technology has several potential applications:

- Municipal water facilities
- Medical facilities
- Laboratories
- Distilleries
- Ultrapure Water Filtration: Semiconductor Fabrication Facility
- Desalination plants
- Wastewater treatment facilities
- Consumer markets

PUBLICATIONS

Patent No: 8343403; 7935259

More Information

National Aeronautics and Space Administration

Michelle P. Lewis

Johnson Space Center

2101 NASA Parkway
Houston, TX 77058
281.483.3809
jsc-techtran@mail.nasa.gov

http://technology.nasa.gov/

www.nasa.gov

NP-2015-02-1312-HQ

NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

MSC-24508-1, MSC-24180-1